NASA National University Satellite Program Workshop Presentation

SPHINX

Space **H**ardening **I**nflatable Structures **Ex**periment Satellite Project

Presenter: Justin Tripp

April 5th, 2002

Program Goals

- Demonstrate deployment mechanism and structural integrity of a tubular gossamer structure in an actual space environment
  - First satellite to test technology in space

    $\Rightarrow$ ideal for a student project

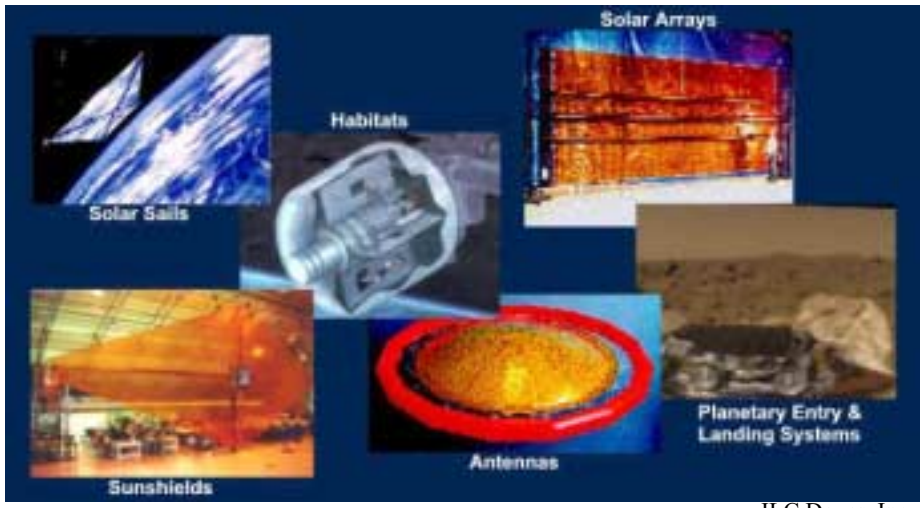
- Develop a cubesat picosatellite to accommodate experimental payload missions involving deployable structures.

Gossamer Structure Background

- Composite fiber material
- Flexible and inflatable at temperature above Tg
- Rigid at temperatures below Tg
- Wide variety of temperature regimes possible (Tg range from -20 to 100 ^{o}C)

Gossamer Structure Technology

- Packaged into small volumes and deployed into elaborate structures.



ILC Dover, Inc.

–Low mass (~60% lighter than aluminum alloy)

–High Strength

–Versatile in application

Payload Options

L'Garde Corp.

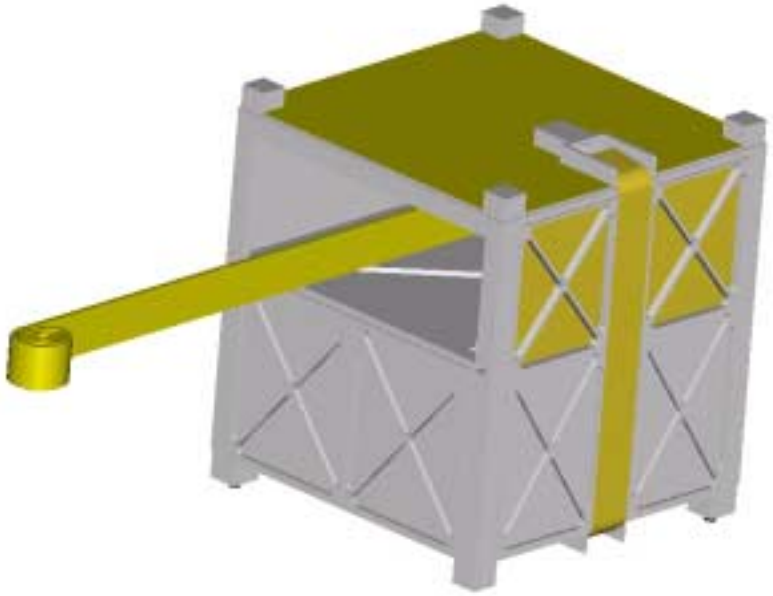
Telescoping Style Boom

ILC Dover, Inc.

Rolled Style Boom

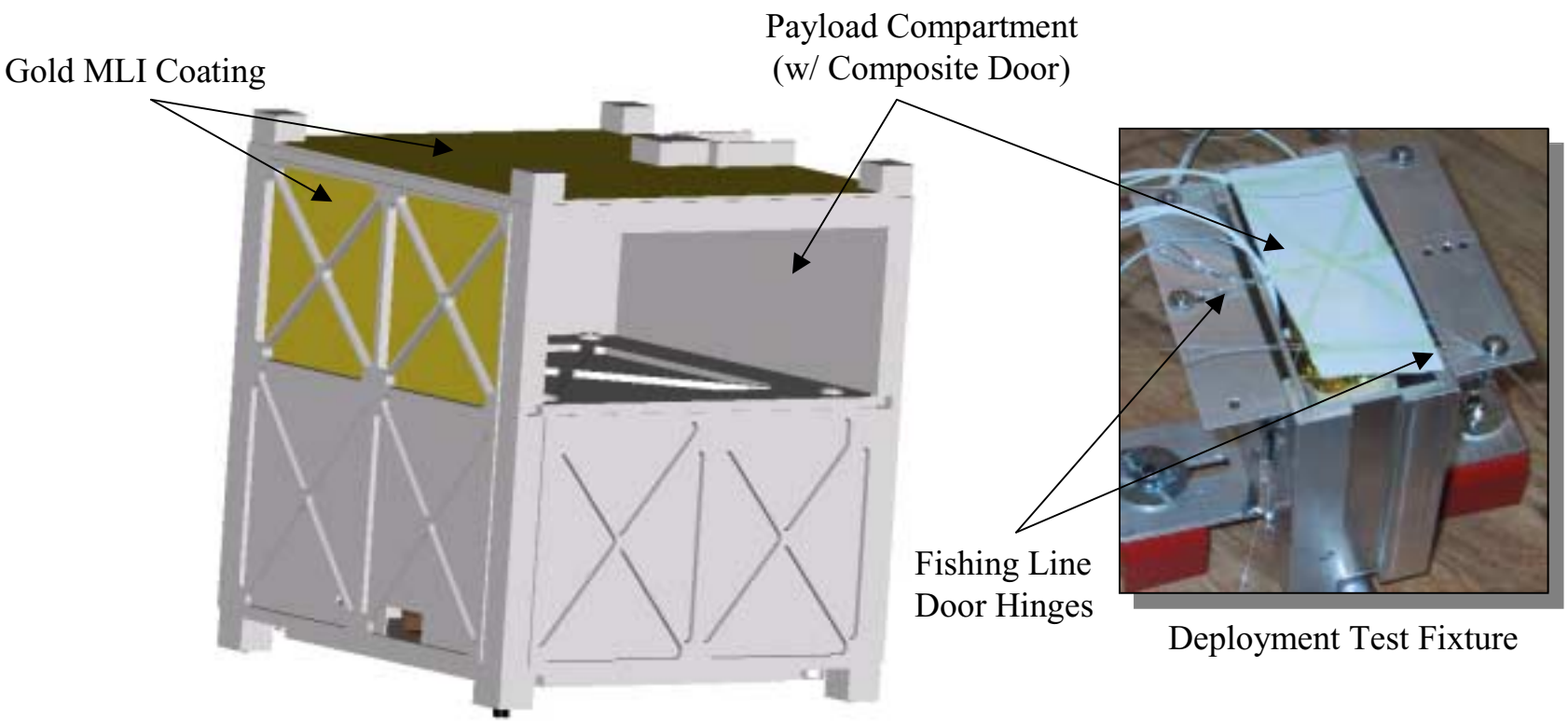
Payload Mission Criteria

- Detect successful deployment – 50%

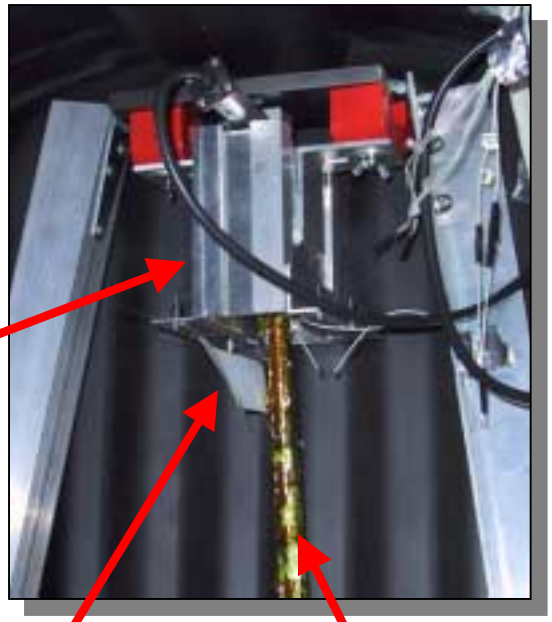


- Measure natural frequency of inflatable structure – 40%
- Extended Mission – 10%

Payload Configuration



Payload Testing

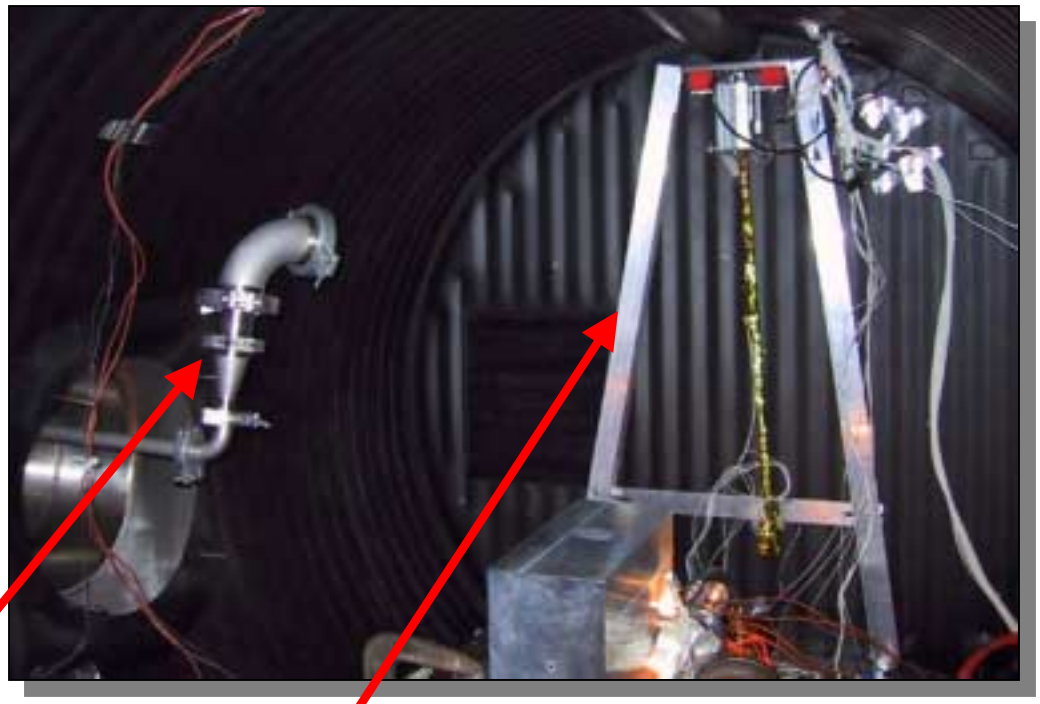


Satellite Mock-up

Opened Door

Boom

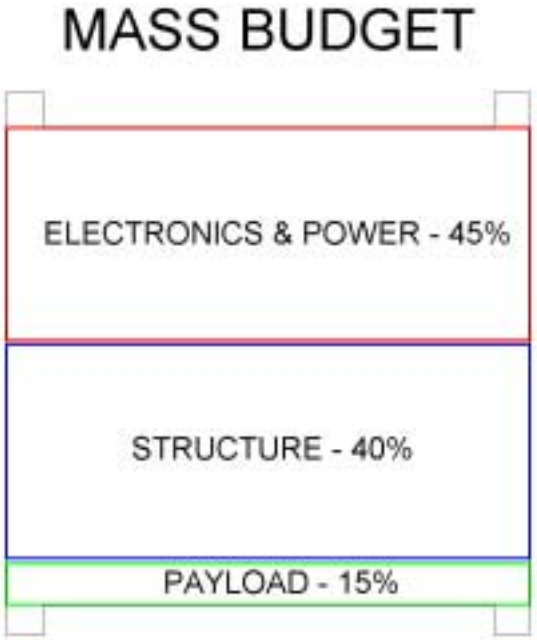
Deployment Testing Inside Thermal-vac Chamber

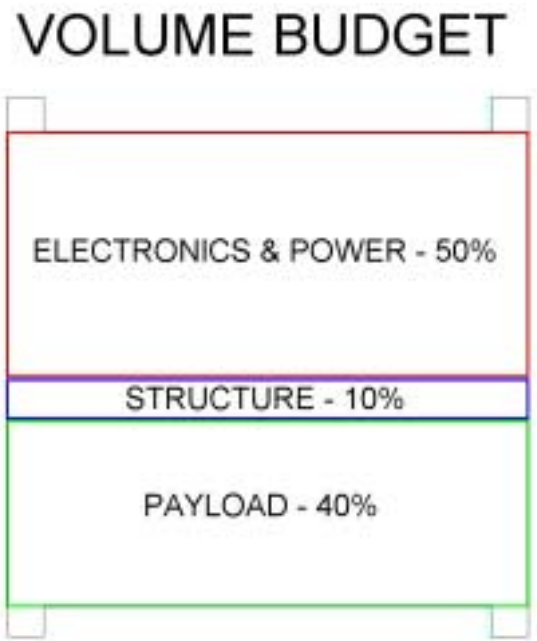


CCD Camera

Test Fixture

System Budgets





Spacecraft design can accommodate a payload of 95mm x 95mm x 40mm size and ~150 grams mass.

Schedule

- Payload Critical Design Review — April, 2002
- Pre-integration design & testing — April, 2002
- Integration Readiness Review — May, 2002
- Qual Testing — May-June, 2002
- Flight hardware build — June, 2002
- Hardware delivery — July, 2002
- Launch (anticipated) — Fall, 2002